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Benthic marine algae of the Juneau, Alaska area[1]

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Abstract: Collections of benthic marine algae in the vicinity of Juneau, Alaska, provided phenological records for 116 species and records of occurrences of another 10. Although the flora shows its greatest affinity to neighbouring British Columbia, the presence of some arctic-amphiboreal elements and western North Pacific taxa distinguishes the area. Eleven new distribution records are included, and fertile tetrasporophytes of *Turnerella mertensiana* are reported for the first time from field-collected material. Name or identity corrections are provided for a number of taxa previously recorded from this area. Brief notes on some of the species are also included.

KEY INDEX WORDS: *marine algae*, *seaweeds*, *phenology*, Turnerella mertensiana, *biogeography*, *Alaska*, *Juneau*, *Auke Bay*.

Introduction

Except for brief visits by the Harriman Alaska Expedition (Saunders 1901) and a group from the University of California (Setchell and Gardner 1903), both in 1899, the inside waters of the Alaska Panhandle have remained poorly studied by phycologists. Saunders recorded only six species of marine macrophytes from Juneau—*Pilayella littoralis*, *Scytosiphon lomentaria*, *Dictyosiphon foeniculaceus*, *Alaria fistulosa*, *Macrocystis pyrifera* (apparently an error here and at Wrangell; no specimens were collected for verification), and *Fucus evanescens*. Setchell and Gardner (1903) added *Enteromorpha prolifera*, *E. compressa*, *Ectocarpus confervoides*, *Laminaria saccharina*, *Cymathere triplicata*, *Alaria tenuifolia*, and *Bangia atropurpurea*.

More recently, we have provided records of some taxa occurring in the Juneau area (Calvin 1977, Lindstrom 1977, Lindstrom and Scagel 1980, Wynne et al. 1983) and have described a number of new species from here (Lindstrom and Wynne 1982, Lindstrom et al. 1983, Lindstrom 1984, Hansen and Lindstrom 1984). However, no single list of species exists to which new records and taxa can be added. The present paper attempts to remedy this absence.

In this paper, we provide a record of seasonal occurrences of intertidal and subtidal seaweeds in the Juneau area. Collections throughout the year are included, but data on phenology should not be considered exhaustive. This is especially true of the kelps, which were frequently observed, but reproductive specimens were seldom collected because of their size. Encrusting coralline algae were also ignored; reproductive material was seldom observed, and specimens were rarely collected.

Materials and Methods

Juneau, the state capital of Alaska, is located in the northern part of the Alaska Panhandle at 58°18′15″N, 134°24′30″W. It is separated from the Pacific Ocean by about 135 km of islands, straits, and passages. Steep mountains behind the city harbour the Juneau Ice Field. Numerous glaciers and rivers arising from its 2500 km^2 mass affect local oceanographic conditions. Sites for intertidal collections were initially selected to represent a gradient in oceanographic conditions, most notably salinity, which generally increases northward from Shaman Island and Point Louisa to the vicinity of North Island and Sunshine and Bridget Coves (Fig. I). All collection sites are accessible by road or small boat from the road system extending along the coast from the city. The city itself is accessible only by air or sea.

Intertidal collections were initiated in April 1973, but most collections were made between May 1976 and September 1977 and between April and August 1979. Subtidal collections began in June 1974.

Voucher specimens of all taxa recorded here have been deposited in UBC.

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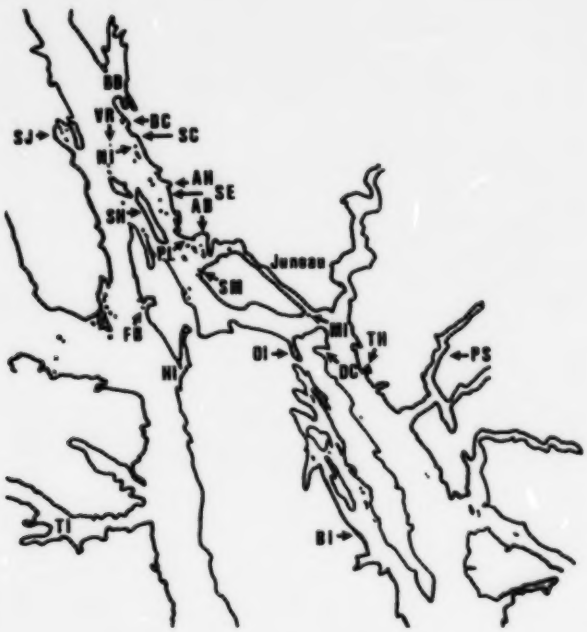

FIGURE I

Collecting sites in the Juneau area. AB = Auke Bay (58°11'N, 134°34'W), AH = Amalga Harbor (58°29'30"N, 134°47'20"W), BB = Berners Bay (58°43'N, 135°00'W), BC = Bridget Cove (58°38'N, 134°57'W), BI = Buck Island (57°44'00"W, 134°06'20"W), DC = Doty Cove (58°07'N, 134°10'W), FB = Funter Bay (58°14'15"N, 134°55'00"W), HI = Hawk Inlet (58°07'40"N, 134°45'15"W), MI = Marmion Island (58°11'55"N, 134°15'20"W), NI = North Island (58°34'35"N, 134°55'40"W), OI = Oliver Inlet (58°08'30"N, 134°19'45"W), PL = Point Louisa (58°22'25"N, 134°43'30"W), PS = Port Snettisham (57°57'30"N, 133°52'00"W), SC = Sunshine Cove (58°36'27"N, 134°56'02"W), SE = Shrine Island (58°28'15"N, 134°47'00"W), SH = Shelter Island (58°26'N, 134°52'W), SJ = St. James Bay (58°34'30"N, 135°09'30"W), SM = Shaman Island (58°18'20"N, 134°41'00"W), TH = Taku Harbor (58°03'30"N, 134°02'00"W), TI = Tenakee Inlet (57°47'N, 134°57'W), VR = Vanderbilt Reef (58°35'30"N, 135°01'00"W).

Results and Discussion

In the Juneau area the intertidal zone ranges from about 6.4 m to –1.4 m. *Fucus gardneri* dominates the intertidal zone down to about +0.6 m. Between about +0.6 m and –0.6 m, *Alaria marginata* can dominate, depending on local conditions, and *Laminaria groenlandica* is the dominant alga below about –0.6 to –0.9 m. The green urchin *Strongylocentrotus droebachiensis* can be locally abundant and can keep the lower intertidal and upper subtidal zones essentially free of seaweeds.

A total of 16 species of Chlorophyta, 30 Phaeophyta, 1 Chrysophyta, and 71 Rhodophyta are reported in Table I. In addition to these taxa, several more can be added from spot collections from outlying areas (Table II).

This flora provides an interesting blend of taxa. The highest affinity is shown with taxa common to neighbouring British Columbia to the south (82%) although some of these occur only in the northern part of the province. However, at least 76% of these taxa have circum North Pacific distributions (westward at least to the Aleutian Islands). Other taxa (15%) occur from Southeast Alaska westward, and several taxa (3%) appear to be disjunct between the North Atlantic (including the Arctic) and the North Pacific.

New northern distribution limits are recorded for *Sphacelaria norrisii*, *Syringoderma abyssicola*, *Phaeosaccion collinsii*, *Porphyra brumalis*, *Callithamnion acutum*—their previous recorded limits were in northern British Columbia (Hawkes et al. 1979)—and *Polysiphonia paniculata*—previously recorded north to the southern tip of the Alaska Panhandle (Hansen et al. 1982). *Leptonematella fasciculata* and *Goniotrichopsis sublittoralis* are recorded for a second time from Alaska; Hansen et al. (1982) included records of both species from Prince William Sound.

New eastern distribution limits are recorded for *Dumontia simplex*, *Neohypophyllum middendorfii*, *Phycodrys riggii*, and *Porphyra pseudolinearis* (*Phycodrys* is now known to occur in northern British Columbia, but this record has yet to be published). *Rhodophyllis* sp. will also represent an eastern limit if its identity with *R. capillaris* can be demonstrated.

Omphalophyllum ulvaceum, *Phycodrys rossica*, and *Phyllophora truncata* represent apparent disjunctions between the North Pacific and the North Atlantic/Arctic.

Notes on selected taxa, Table I.

The presumed alternate phase of *Acrosiphonia arcta*, *Chlorochytrium inclusum* Kjellman, is encountered in various foliose hosts throughout the year.

McRoy et al. (1971) and Calvin (1977) reported the occurrence of *Enteromorpha crinita* and *E. clathrata*, respectively, from Berners Bay. In this study, we recognize the occurrence of only *E. prolifera* among the species of *Enteromorpha* in which cells are arranged in regular longitudinal rows throughout the thallus.

The conspicuous intertidal skein-forming cladophoralean species is now recognized to be *Rhizoclonium tortuosum* based on studies by Blair (1983). This entity was included as *Chaetomorpha cannabina* (Areshoug) Kjellman by Lindstrom (1977). Blair also included a record of *Chaetomorpha melagonium* (Webet et Mohr) Kuetzing from Juneau, collected by Saunders (FH 243). Although the present authors have not found it, we have seen a specimen apparently attributable to this species, collected at Cove Pt., Berners Bay, 16 Sept. 1970, in ALA.

A single species of *Ulothrix*, *U. flacca*, is recognized in the local flora following the inclusion of *U. laetevirens* (Harvey in Hooker) Collins and *U. pseudoflacca* Wille in this species (Lokhorst 1978).

A single intertidal species of *Alaria*, *A. marginata*, is recognized in the Juneau area despite a large amount of morphological plasticity. The occurrence of this species, usually considered to be a cumatophyte [a plant preferring exposed habitats], is believed to be the result of the large tidal amplitude and hence the relatively strong currents.

Nereocystis luetkeana and *Alaria fistulosa* were observed a number of times but not collected because of their size.

Several species groups in the Ceramiaceae could not

be clearly differentiated in the local flora (they had characteristics of two or more species); the species are therefore included under the genus name only. These include *Antithamnionella glandulifera* (Kylin) Wollaston and *A. pacifica* (Harvey) Wollaston, *Platythamnion pectinatum* Kylin and *P. villosum* Kylin, and *Ptilota filicina* J. Agardh, *P. plumosa* (Hudson) C. Agardh, and *P. serrata* Kuetzing.

Sheath and Cole (1984) have resurrected the name *Bangia vermicularis* Harvey for the Pacific species of this genus. However, Cole et al. (1983) have shown that at least two chromosomally and seasonally distinct and geographically somewhat separated Bangias occur in British Columbia. Until the taxonomy of the Pacific species is resolved, we prefer to use only the generic designation for the local species.

Previous records of *Callophyllis crenulata* from the Juneau area were included under *C. pinnata* Setchell et Swezy by Lindstrom (1977).

Vegetatively, the habits of *Callophyllis cristata* and *C. flabellulata* overlap, and the identity of both species in the Juneau area needs to be verified.

Constantinea subulifera has been recorded previously from Alaska only once, at Valdez (Calvin and Lindstrom 1980). However, Powell in his Ph.D. thesis (1964) recorded its occurrence along the Alaskan coast at Khantaak on Adak, Cold Bay, Yakutat Roads, and Harbor Pt. This species thus appears to be distributed continuously from northern Washington to northern Japan.

A new genus and species is being proposed (Lindstrom 1987) for the species from the Juneau area previously identified as *Farlowia compressa* by Lindstrom (1977).

Goniotrichopsis sublittoralis was clearly recognized in at least one January collection from Auke Bay by the numerous discoid chloroplasts per cell. Its identity in other collections could not be definitely confirmed because chloroplast shape was not evident in the preserved material that was examined.

The name *Leachiella pacifica* was proposed to replace that of *Choreocolax polysiphoniae* Reinsch for this parasite from California and Washington. However, Kugrens (1982) failed to note the reports of this taxon from British Columbia and Alaska, where it was previously recorded from Sitka (Saunders 1901). Goff and Coleman (1984) have questioned the distinction between the two species.

Records of the tetrasporophyte of *Mastocarpus papillatus*, *Petrocellis middendorfii* (Ruprecht) Kjellman, are included under the former species.

The specimens of *Membranoptera* from the Juneau area are thought to represent a single, highly variable taxon. In late April and early May, many short, sharp marginal teeth are present on specimens. At other times of the year, the margins are relatively smooth. As Wynne (1970) observed, the thalli often have well-developed midribs in older regions and only moderately developed midribs in younger parts. Wynne also pointed out the similarities between *M. spinulosa*, *M. beringiana* (Ruprecht) Zinova, and *M. serrata* (Postels et Ruprecht) Zinova from the northwestern Pacific Ocean and Bering Sea and *M. denticulata* (Montagne) Kylin (included by Mathieson et al. 1969 in *M. alata* (Hudson) Stackhouse) from the North Atlantic. The high degree of seasonal variability in the taxon from the Juneau area lends support to the idea that at least some of these taxa may be conspecific. This species was included by Lindstrom (1977) as *M. weeksiae* Setchell et Gardner in Gardner.

A single cystocarpic specimen of *Odonthalia* sp. was collected subtidally at Shrine Island on 9 March 1986 by Caryn Good. Reproductive structures were on ordinary branches and arranged in a racemose manner. Cystocarps were hemispheric to globose, to at least 800 μm in diameter and had broad, non-urceolate ostioles. Calcars were inconspicuous to at least 350 μm long. This combination of characters does not precisely fit any previously circumscribed species of costate *Odonthalia* (Perestenko 1977, Masuda 1981) and therefore suggests either that local specimens represent a new species or that existing species are too narrowly circumscribed.

Palmaria hecatensis was included by Lindstrom (1977) as *Rhodymenia palmata* f. *palmata*. *Palmaria callophylloides* was included by Lindstrom (1977) as *Rhodymenia palmata* f. *sarniensis*.

Several collections of tetrasporic and cystocarpic specimens of a species of *Peyssonnelia* have been made subtidally in Auke Bay. The cruciate tetrasporangia measured (17-) 22-31 (-33) by (39-) 56-77 (-82) μm (n=60), notably longer than the dimensions of 25-30 by 45-55 μm given by Kylin (1925) for his new species *P. pacifica* from the San Juan Islands, Washington. Further study of the Auke Bay specimens is necessary before they can be ascribed to a species.

A second species of *Phycodrys*, *P. rossica*, was identified by Dr. M. Wynne, University of Michigan. He ascribed the local material to this species on the basis of its distinctive branching habit (secondary blades arise from parental blades by a sharply distinguished stalk) and the restriction of tetrasporangia to fine, thread-like outgrowths located along the margin of the blade and extending from its tip. However, the presence of gland cells in the local species does not accord with the Sinova species. This species was listed as *P. setchellii* Skottsberg by Lindstrom (1977).

The *Callithamnion biseriatum* Kylin of McRoy et al. (1971) from Marmion Island was found to be *Pleonosporium pedicellatum*.

The name *Polysiphonia senticulosa* Harvey (1862, = *Orcasia senticulosa* (Harvey) Kylin) is used for a low intertidal species with four pericentral cells, no trichoblasts, pseudodichotomous branching, sometimes with short determinate laterals, rounded or pointed apical cells, seriate tetrasporangia to about 75 μm in diameter that can be borne in ordinary branches or in adventitious, sometimes tufted axillary branches, spermatangial branches arising from an entire trichoblast primordium, and somewhat urceolate cystocarps. The local material conforms well to the type specimen of *P. senticulosa* (BM-K! sterile) as well as to an isotype (LD 40091! tetrasporic), both collected by David Lyall, Orcas I., April 1858. This species is very close to *P. morrowii* Harvey from Japan, and Kudo and Masuda (1981) concluded that Japanese *P. senticulosa* fits within *P. morrowii*. We prefer to use the name of the species associated with the northeastern Pacific until further work has been done to show the conspecificity or distinctness of these two species. *Polysiphonia senticulosa*

TABLE I

Seasonal and geographic distribution of seaweeds collected in the Juneau area. Abbreviations: I = intertidal, L = low intertidal/upper subtidal, S = strictly subtidal, E = ephemeral (individual plants present 5 months or less per year), A = annual (individual plants present more than 5 months per year), P = perennial, f = fertile, + = present/vegetative, p = plurilocular, u = unilocular, pr = propagula, c = cystocarpic, l = monosporic, m = male, n = female, t = tetrasporic, w = with paraphyses. Geographic abbreviations as in Figure I.

Habitat / *Phenological Classification*	*Species*	*Month* J	F	M	A	M	J	J	A	S	O	N	D	*Location*
CHLOROPHYTA														
I A?	*Acrosiphonia arcta* (Dillwyn) J. Agardh		+	+	+	+	+	+	+	+	+	+	+	AB, BC, NI, PL, SC, SE, SM
I E?	*Blidingia minima* (Naegeli) Kylin					+	+	f						AB, SM
I A?	*Cladophora sericea* (Hudson) Kuetzing	+	+	+	+	+	f	f	+	+	+			AB, BC, NI, PL, SE, SM
I E?	*Enteromorpha compressa* (Linnaeus) Greville							f		f				BC
I A?	*Enteromorpha intestinalis* (Linaeus) Link	+	+		f	f	f	f	f					AB, BC, NI, PL, SC, SE, SM
I E?	*Enteromorpha linza* (Linnaeus) J. Agardh	+			+	+	f	f	+	f	+	+		AB, BC, NI, PL, SC, SE, SM
I A?	*Enteromorpha prolifera* (Mueller) J. Agardh	f?		f	f	+	f	f	f	f		f		BC, PL, SC, SE, SM
I E	*Monostroma grevillei* (Thuret) Wittrock			+	f	f	f							AB, BC, PL, SE, SM
I E	*Prasiola* sp.	+		+	f									AB, SM
I E?	*Prasiola meridionalis* Setchell et Gardner	f				f	f		f					BC, SM
I P	*Rhizoclonium tortuosum* (Dillwyn) Kuetzing	+	+	+	+	+	+	+	+		+	+	+	AB, BC, PL, SC, SE, SM
I E?	*Rosenvingiella polyrhiza* (Rosenvinge) Silva	+			+				+					AB, SM
I E?	*Ulothrix flacca* (Dillwyn) Thurett			f	f	f	+	f		f				BC, NI, PL, SE, SM
L A?	*Ulva fenestrata* Postels et Ruprecht		+	+	f	f	f	+	f	+	f			AB, BC, NI, PL, SE, SM
L A	*Ulvaria obscura* (Kuetzing) Gayral	f	+	f	f	f	f	f	f	+	+	+	+	AB, BC, DC, FB, NI, PL, SC, SE, SM
L E?	*Ulvaria oxysperma* (Kuetzing) Bliding						+		+					BC
CHRYSOPHYTA														
I E	*Phaeosaccion collinsii* Farlow			f	f									AB, PL, SE
PHAEOPHYTA														
L P	*Agarum cribrosum* Bory			+	+		+	+	+	+				AB, BC, FB, PL, SC, SE, SM
S A	*Alaria fistulosa* Postels et Ruprecht													SC, VR
I A	*Alaria marginata* Postels et Ruprecht	+		+	u	u	u	u	u	u	u			AB, BC, PL, SC, SE, SM
I A	*Chordaria flagelliformis* (Mueller) C. Agardh	u					+	u	u	u	u			AB, BC, PL, SC, SE, SM
I E	*Coilodesme bulligera* Stroemfelt				u	u	+							AB, BC, NI, PL, SE, SM
L A	*Costaria costata* (Turner) Saunders	+		+	+		u	u						AB, BC, MI, PL, SC, SE, SM
L A	*Cymathere triplicata* (Postels et Ruprecht) J. Agardh		+		+	+	+	+	u	+	u			AB, BC, PL, SC, SE, SM

TABLE I (continued)

Habitat	*Phenological Classification*	*Species*	*J*	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*	*Location*
								Month							
L	P	*Desmarestia aculeata* (Linnaeus) Lamouroux	+	+		+		+	+	u	+				AB, BC, DC, SC, SE, SM
S	P?	*Desmarestia viridis* (Mueller) Lamouroux		+	+	+	+	+	u	u					AB, BC, PL, SC, SE, SM
I	A	*Dictyosiphon foeniculaceus* (Hudson) Greville				+		u	u	u	u				AB, BC, PL, SC, SE, SM
L	P?	*Ectocarpus parvus* (Saunders) Hollenberg	pu	p	u		p	p	p	p	p	p			AB, BC, MI, PL, SM
I	A	*Elachista fucicola* (Velley) Areschoug				u		u	u	u	u	u			BC, PL, SC, SE, SM
I	E	*Eudesme virescens* (Carmichael) J. Agardh						u	u	u					BC, SE, SM
I	P	*Fucus gardneri* Silva	+	+	+	f	f	f	f	f	f	f	+	+	AB, BC, NI, PL, SC, SE, SM
L	P	*Laminaria groenlandica* Rosenvinge	+		+	+	+	+	+	+	+	u			AB, BC, PL, SC, SE, SM
L	P?	*Laminaria saccharina* (Linnaeus) Lamouroux						+	+	+					AB, BC, SM
I	A	*Leathesia difformis* (Linnaeus) Areschoug				+	+	+	+	+	+				AB, BC, NI, PL, SC, SE, SM
L	E?	*Leptonematella fasciculata* (Reinke) Silva	+						p						AB, BC
I	P?	*Myelophycus intestinale* Saunders	+	+	+	+	u	up	+	p	+		+		AB, BC, NI, PL, SC, SE, SM
I	E?	*Myrionema strangulans* Greville						u							AB
S	A	*Nereocystis luetkeana* (Mertens) Postels et Ruprecht													BC, MI, PL, SC, SM
S	A?	*Omphalophyllum ulvaceum* Rosenvinge	+	+	+	+	+		u	u					AB, BC
I	E	*Petalonia fascia* (Mueller) Kuntze			+	p	p	+	+			+	+		AB, BC, PL, SC, SE, SM
I	P?	*Pilayella littoralis* (Linnaeus) Kjellman	pu		p	u	u	u	pu	p	pu	pu	u		AB, BC, PL, SC, SE, SM
L	P	*Ralfsia fungiformis* (Gunnerus) Setchell et Gardner	+	+	+			+	+	+	+	+		+	AB, BC, PL, SC, SE, SM
I	E	*Scytosiphon lomentaria* (Lyngbye) Link				p	p	+	+						AB, BC, NI, PL, SC, SE, SM
I	A	*Soranthera ulvoidea* Postels et Ruprecht				+	u	u	u	u	u	u			AB, BC, NI, PL, SC, SE, SM
L	P?	*Sphacelaria rigidula* Kuetzing		+	+	+	+	+	pr	pr	pr	pr			AB, BC, PL, SE, SM
S	P?	*Sphacelaria norrisii* Hollenberg							+						BC
S	P?	*Syringoderma abyssicola* (Setchell et Gardner) Levring							+	f?					BC
RHODOPHYTA															
L	P	*Ahnfeltia plicata* (Hudson) Fries		+		+	+	+	+	+	+	+			BC
L	A?	*Antithamnionella* sp.		+	+	c	+		+		ct			+	AB, BC, PL, SE
I	A?	*Audouinella microscopica* (Naegeli) Woelkerling					l	+	+		+				BC, SM
I	A?	*Audouinella pacifica* (Kylin) Garbary		+					l						AB, BC

TABLE I (continued)

Habitat / *Phenological Classification*	*Species*	*J*	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*	*Location*
		Month												
I E	*Bangia* sp.			+	+	+		+						AB, PL, SE
L P	*Bossiella cretacea* (Postels et Ruprecht) Johansen						+	+	+	+				BC, SC
L A?	*Callithamnion acutum* Kylin	mn	c		t									AB, BC
S P?	*Callophyllis crenulata* Setchell	t	+	+	+		+		+	c	+		ct	AB, AH, BC, DC, FB, SE
L P?	*Callophyllis cristata* (C. Agardh) Kuetzing	t	ct	c	t	c	ct	ct	c		+		ct	AB, FB, PL, SC
S P?	*Callophyllis flabellulata* Harvey	ct	ct	ct	+		+	+	+	t	t	t	ct	AB, BC, DC, FB, HI, SE
L A?	*Ceramium gardneri* Kylin						+	+	+	+				BC, SE
L A?	*Chondrus* sp.	c	c	t	cm	c	c	c	c	t	c		+	AB, BC, NI, PL, SC, SE, SM
L P	*Constantinea rosa-marina* (Gmelin) Postels et Ruprecht	ct	+	mn	mn	mnw	nw	mw					c	AB, BC, PL, SC, SE, SM
L P	*Constantinea subulifera* Setchell	+	+		m	+	nw	+	nt	+				AB, BC, PL, SC, SE, SM
I A	*Cryptosiphonia woodii* (J. Agardh) J. Agardh		+	+	n	t	ct	t	ct					AB, BC, NI, PL, SE, SM
L E	*Delesseria decipiens* J. Agardh				+			t						BC
L A	*Dilsea californica* (J. Agardh) Kuntze	nt		t				+	n				c	BC, PL, SC, SE, SM
I E	*Dumontia contorta* (Gmelin) Ruprecht			+	mnt	ct	ct							AB, AH, BC, NI, PL, SE, SM
I A?	*Endocladia muricata* (Postels et Ruprecht) J. Agardh	+	+	+	+	mn	t	t	+	+	+			BC, NI, PL, SC, SE, SM
I A?	*Erythrotrichia carnea* (Dillwyn) J. Agardh	+	f	+	+	+	+	f	f	+	f	f		AB, BC, PL, SE, SM
S P	*"Farlowia compressa"*	n	+				n		mn		n	n	cn	AB, SE
I A	*Gloiopeltis furcata* (Postels et Ruprecht) J. Agardh	+	+	+	m	mt	ct	ct	t	+	+	+		AB, BC, NI, PL, SC, SE, SM
L P?	*Goniotrichopsis sublittoralis* Smith	+	+					+						AB, BC
I A	*Halosaccion americanum* I. K. Lee	t	t	+	t	+	+	t	+	+	t	t		AB, BC, NI, SC, SE, SM, TH
S P?	*Hideophyllum yezoense* (Yamada et Tokida) Zinova	+						+			c			HI, MI
I P	*Hildenbrandia rubra* (Sommerf.) Menegh.	t			+	+		t	+	+				BC, PL, SC, SE
S P	*Hommersandia maximicarpa* Hansen et Lindstrom	ct	+	+	+	+	n	+	n	+	+	ct	ct	AB, AH
L A?	*Leachiella pacifica* Kugrens							t						BC
I A?	*Mastocarpus papillatus* (C. Agardh) Kuetzing	c	c	c	c	c	c	+	+	+	c	t	+	AB, BC, NI, PL, SC, SE, SM
L A?	*Membranoptera spinulosa* (Ruprecht) Zinova	cmt	ct	t	ct	ct	+	+	+	+	m		ct	AB, AH, BC, DC, MI, PL, SC, SE, SM, TH
S A	*Neodilsea borealis* (Abbott) Lindstrom	ct	ct	+	+	t	cn	mnct	mnt	nt	nct	nct	+	AB, AH, BC, FB, PL, SC, SE, SM
L A	*Neodilsea natashae* Lindstrom				+	mn	n	n	n	mnt	ct	ct		AB, BC, NI, PL, SC, SM
L P?	*Neohypophyllum middendorfii* (Ruprecht) Wynne				+	+		+	+					SC, BC,

TABLE I (continued)

Habitat / *Phenological Classification*	*Species*	*J*	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*	*Location*
							Month							
L P	*Neorhodomela larix* (Turner) Masuda				+	+			+					NI, SE
I P	*Neorhodomela oregona* (Doty) Masuda	t	+	t	t	mt	mt	mnc	ct	+	t	m	t	AB, BC, NI, PL, SC, SE, SM
L P	*Odonthalia* sp.	+	+	c	+	+	+	+	+	+	+	+	+	AB, BC, DC, SC, SE, SM
L P?	*Odonthalia floccosa* (Esper) Falkenberg	+	+	+	+	+	c	ct	ct	c	+			AB, BC, NI, SC, SE, TH
S P	*Opuntiella californica* (Farlow) Kylin	+	+			m	+	+	+					AB, BC, HI, SE
I A?	*Palmaria callophylloides* Hawkes et Scagel	t	t		t	+	+	+	+	+				BC, NI, SE, SM
I A	*Palmaria hecatensis* Hawkes	t	t		t	+	+	+	+	+		+		BC, PL, SE, SM
L A	*Palmaria mollis* (Setchell et Gardner) van der Meer et Bird	+	+	+	mt	mt	t	t	+	+	+	+	t	AB, BC, NI, PL, SC, SE, SM
S P	*Peyssonnelia* sp.	nt	t											AB
L P?	*Phycodrys riggii* Gardner				+	+	+	+	+	+				BC, SC
S P?	*Phycodrys rossica* (Sinova) Zinova	+	ct	+			+	+		+				AB, BC, TH
S P	*Phyllophora truncata* (Pallas) Zinova	t	t	t	t		+	+		+	+	t		AB, FB, SC
S A?	*Platythamnion* sp.	+	m					mt	+					AB, BC
L E?	*Pleonosporium pedicellatum* Lindstrom, Wynne et Calvin	c									+	+		MI, PL
L A	*Pleonosporium vancouverianum* (J. Agardh) J. Agardh	+	c	n	+			mnc	nc		mnc		nc	AB, BC, PL
L A?	*Polysiphonia hendryi* var. *deliquescens* (Hollenberg) Hollenberg						t		+	+			t	BC, SE
L A?	*Polysiphonia pacifica* Hollenberg	+	+	+	mnt	t	ct	t	+	+			+	AB, AH, BC, PL, SC, SE, SM
L A?	*Polysiphonia paniculata* Montagne							+						BC
L P?	*Polysiphonia senticulosa* Harvey	+	+		mn	mt	ct	ct	ct					AB, BC, PL, SC, SE, SM
I E	*Porphyra abbottae* Krishnamurthy			?	f	f		?						AB, BC, NI, PL, SC, SE, SM
I E	*Porphyra brumalis* Mumford			f	f	f	f							AB, AH, BC, NI, PL, SE, SM
L E	*Porphyra miniata* (C. Agardh) C. Agardh			f	f	f	f	f						AB, BC, PL, SC, SE, SM
I E	*Porphyra pseudolanceolata* Krishnamurthy				f	f								AB, BC
I E	*Porphyra pseudolinearis* Ueda				m									BC
L A	*Pterosiphonia bipinnata* (Postels et Ruprecht) Falkenberg	+	+	+	+	t	t	t	t	t	t	+	+	AB, BC, NI, PL, SC, SE, SM
L A?	*Pterosiphonia hamata* Sinova					c								SC
L P?	*Ptilota* sp.	ct	nt		+	t	+	c	t	+	+			AB, BC, DC, MI, PS, SC, SE
L P	*Ptilota asplenioides* (Esper) C. Agardh		+		+	+		+	+	+				BC, SC

TABLE I (continued)

Habitat / Phenological Classification	Species	J	F	M	A	M	J	J	A	S	O	N	D	Location
		Month												
I A?	*Rhodochorton purpureum* (Lightfoot) Rosenvinge	t	+					+						AB
L A?	*Rhodochorton spetsbergense* (Kjellman) Kjellman	t	t	t	t	t	t	t	t		t	t		AB, BC, PL, SC, SE, SM
S P?	*Rhodophyllis* sp.	+						+	+					BC, TH
L A	*Rhodymenia pertusa* (Postels et Ruprecht) J. Agardh	+	+	+	t	t	ct	ct	ct					AB, BC, DC, HI, MI, NI, SC, SE
L P?	*Scagelia pylaisaei* (Montagne) Wynne	mnt	mnt	ct	ct	ct	+	mt	mct	c	nt	t	ct	AB, BC, SC, SE, SM
S A?	*Schizoclaenion rhodotrichum* Wynne et R. E. Norris		+					+						AB
S A?	*Tayloriella abyssalis* Wynne							+	+					AB, BI
L A	*Tokidadendron kurilensis* (Ruprecht) Perestenko		+		t	t	+	+	+					BC
S P?	*Tokidaea chilkatensis* Lindstrom et Wunne	t	ct	t	+	+	n	mn	c	nc	c		ct	AB, BC, FB, HI, TH
L P?	*Turnerella mertensiana* (Postels et Ruprecht) Schmitz	t	t	ct	+	+	+	+	+		+	c		AB, BC, NI, PL, SC, SE, SM

may also be closely related to N Atlantic *P. urceolata*, which also usually lacks trichoblasts, has seriate tetrasporangia 75-80 μm in diameter, spermatangial branches arising from an entire trichoblast primoridum, and urceolate cystocarps (Kapraun and Rueness 1983). The northeastern Pacific species that has been identified as *P. urceolata* should more properly be called *P. pungens* Hollenberg (1942), and this species, too, possesses several characteristics in common with *P. senticulosa*, including sharply pointed determinate branches, no trichoblasts, and seriate tetrasporangia.

Porphyra pseudolinearis is the name tentatively given to several male specimens from Bridget Cove. This species has been recorded from Amchitka Island by Wynne (1972), who noted that it had previously been considered endemic to the Sea of Japan. The distinction of the Alaskan specimens from *P. pseudolanceolata*, both of which are monostromatic and have a single chloroplast per cell, needs to be investigated.

The specimens of *Rhodophyllis* collected from *Frusitriton oregonensis* in 15-23 m at Bridget Cove resemble *Rhodophyllis capillaris* Tokida (1932) from the northwestern Pacific and adjacent seas (Tokida 1954). Both have a diminutive habit, but they differ somewhat in size and shape of cells composing the cortical layers and in the presence of numerous lateral outgrowths resembling adhesive organs on the Bridget Cove material. Since all plants collected to date have been sterile, their identity cannot yet be resolved.

A single species of *Tokidadendron*, *T. kurilensis*, is recognized from Alaska.

Extensive crusts with large gland cells and zonately divided tetrasporangia reminiscent of the genus *Cruoria* were identified as the tetrasporophytic phase of *Turnerella mertensiana* (Kasahara 1980). This is the first record of field-collected tetrasporophytes of *Turnerella* in the North Pacific. The specimens identified as *Schizymenia epiphytica* (Setchell et Lawson) Smith et Hollenberg by Lindstrom (1977) should be included in *Turnerella mertensiana*.

Among the specimens, several examples were found in which female and tetrasporic reproductive structures were observed on the same plants. In one specimen of *Dilsea californica* collected in January, carpogonial branches and tetrasporangia were observed in the same thallus, and in one specimen of *Antithamnionella* sp. cystocarps and tetrasporangia also appeared together on the same thallus.

Reproduction appears to be inhibited in a number of species found in this area. No reproductive specimens have been observed among any of the following species, which were fairly common in the collections: *Acrosiphonia arcta*, *Rhizoclonium tortuosum*, *Leathesia difformis*, *Ralfsia fungiformis*, *Ahnfeltia plicata*, *Audouinella microscopica*, *Bangia* sp., *Bossiella cretacea*, *Phycodrys riggii*, and *Ptilota asplenioides*. In some Rhodophyta, only tetrasporangia were found although the species are known to possess an alternation of isomorphic generations. Included here are *Endocladia muricata*, *Polysiphonia hendryi* var. *deliquescens*, *Pterosiphonia bipinnata*, and *Tokidadendron kurilensis*. Lack of cystocarpic specimens may be due to (1) lesser abundance, (2) more cryptic habitat, or (3) environmental inhibition of sexual reproduction with apomeitoic recyling of the diploid phase.

Moore et al. (1980) have presented evidence showing that the 13 C August isotherm that touched the Pacific coast near the Oregon-California border 18,000 years ago

now touches the coast near Sitka, whereas the 11 C isotherm that then touched the coast near Sitka, now touches the coast near Chirikof Island.

Maximum average surface temperatures in Auke Bay are of the order of 10-12 C, and minimums are near 2-3 C (Wing 1976). This marine environment affords a colder habitat than the outer coast of the Alaska Panhandle. Although the marine algal records from the Sitka area are in serious need of updating (Setchell & Gardner 1903), our present knowledge suggests the Juneau area is at least more strongly dominated if not richer in both arctic-amphiboreal and western North Pacific taxa. Taxa in the former category include *Callophyllis cristata*, *Dumontia contorta*, *Membranoptera spinulosa*, *Omphalophyllum ulvaceum*, *Physodrys rossica*, *Phyllophora truncata*, and *Turnerella*; taxa in the latter category include *Constantinea rosa-marina*, *Dumontia simplex*, *Hideophyllum yezoense*, *Neodilsea natashae*, *Neohypophyllum middendorfii*, *Pleonosporium kobayashii*, *Rhodophyllis* sp., and *Tokidaea*. This apparent cryophilic enrichment of the Juneau flora may also suggest that these colder inside waters may serve as refugia for Ice Age species—taxa that expanded their distributions during the glacial advances of the Pleistocene and that may now be restricted to the cold pockets of these inside fjords and possibly also to outside headlands with strong upwelling.

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TABLE II

Incidental species from outlying areas. For key to locations, see Figure 1.

Species	*Date*	*Phenology*	*Location*
Codium ritteri Setchell et Gardner	28 May 1979	sterile	BI
Analipus japonicus (Harvey) Wynne	30 May 1976	sterile	NI
	23 July 1983	plurilocular	BI
Dumontia simplex Cotton	12 May 1974	cystocarpic	BI
Iridaea flaccida (Setchell et Gardner) Silva	16 Aug. 1981	tetrasporic	HI
Microcladia borealis Ruprecht	11 July 1979	sterile	FB
	26 Aug. 1980	tetrasporic	BI
Pleonosporium kobayashii Okamura	3 June 1979	polysporic	BI
	5 Apr. 1980	polysporic	SH
Pugetia fragilissima Kylin	12 Jan. 1978	cystocarpic	SJ
Weeksia coccinea (Harvey) Lindstrom	9-12 Feb. 1975	sterile	TI

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